# S.Q. TUBE

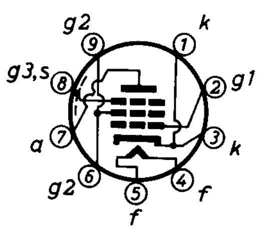
Special quality pentode designed for use as wide band amplifier.

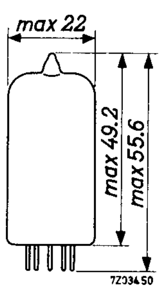
| QUICK REFERENCE DATA | | | |
|---|---|---|---|
| Life test | 10 000 hours | | |
| Low interface resistance | | | |
| Mechanical quality | Shock and vibration resistant | | |
| Base | Noval. Gold plated pins | | |
| Heating | Indirect<br>A.C. or D.C.; Parallel supply | | |
| Heater voltage | $V_f$ | 6.3 | V |
| Heater current | $I_f$ | 340 | mA |
| Anode current | $I_a$ | 35 | mA |
| Mutual conductance | S | 50 | mA/V |
| Equivalent noise resistance | $R_{eq}$ | 110 | Ω |
| Quality factor $\frac{S}{2\pi(C_{g_1}+C_a+5)}$ | | 250 | MHz |

**DIMENSIONS AND CONNECTIONS**

Dimensions in mm

Base: Noval



## CHARACTERISTICS

Column I Nominal value or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

| | | I | II | III | |
|---|---|---|---|---|---|
| Heater voltage | $V_f$ | 6.3 | | | V |
| Heater current | $I_f$ | 340 | 320 - 360 | | mA |
| Anode supply voltage | $V_{ba}$ | 135 | | | V |
| Grid No.3 voltage | $V_{g_3}$ | 0 | | | V |
| Grid No.2 supply voltage | $V_{bg_2}$ | 165 | | | V |
| Grid No.1 supply voltage | $+V_{bg_1}$ | 12.5 | | | V |
| Cathode resistor | $R_k$ | 360 | | | Ω |
| Anode current | $I_a$ | 35 | (negligible spread) | | mA |
| Grid No.2 current | $I_{g_2}$ | 5.0 | 4.4 - 5.6 | | mA |
| Mutual conductance | S | 50 | 42 - 58 | min. 35 | mA/V |
| Internal resistance | $R_i$ | 42 | | | kΩ |
| Amplification factor of grid No.2 to grid No.1 | $\mu_{g_2g_1}$ | 57 | | | |
| Negative grid current | $-I_{g_1}$ | | max. 0.1 | max. 0.2 | µA |
| Equivalent noise resistance | $R_{eq}$ | 110 | | | Ω |
| Frequency = 45 MHz | | | | | |
| Input resistance | $r_{g_1}$ | 415 | | | Ω |
| Frequency = 100 MHz | | | | | |
| Quality factor $\frac{S}{2\pi(C_{g_1}+C_a+5)}$ | | | | | |
| a) without shield | | 250 | | | MHz |
| b) with shield | | 245 | | | MHz |
| Anode supply voltage | $V_{ba}$ | 120 | | | V |
| Grid No.3 voltage | $V_{g_3}$ | 0 | | | V |
| Grid No 2 supply voltage | $V_{bg_3}$ | 150 | | | V |
| Cathode resistor | $R_k$ | 47 | | | Ω |
| Anode current | $I_a$ | 35 | 31 - 39 | | mA |

**CHARACTERISTICS** (continued)

| | | II | III | |
|---|---|---|---|---|
| Hum voltage | $V_{g_1}$ | max. 150 | | μV |
| Grid No.1 resistor $R_{g_1}$ = 0.5 MΩ | | | | |
| Midtap heater transformer grounded | | | | |
| Cathode resistor decoupled | | | | |
| Leakage current between cathode and heater | $I_{kf}$ | max. 10 | max. 20 | μA |
| Voltage between cathode and heater $V_{kf}$ = 100 V | | | | |
| Insulation resistance between anode and other electrodes | R | min. 100 | min. 40 | MΩ |
| Measured with V = 250 V | | | | |

**CAPACITANCES**

| | | Without external shield | | With external shield | | |
|---|---|---|---|---|---|---|
| | | I | II | I | II | |
| Anode to grid No.3, grid No.2, cathode, heater and screen | $C_{a/g_3g_2kfs}$ | 3.5 | 3.2-3.8 | 4.1 | 3.9-4.3 | pF |
| Grid No.1 to grid No.3, grid No.2, cathode, heater and screen | | | | | | |
| ($I_k$ = 0 mA) | $C_{g_1/g_3g_2kfs}$ | 14.5 | 13- 16 | 14.5 | 13- 16 | pF |
| ($I_k$ = 40 mA; f = 100 Mc/s) | $C_{g_1/g_3g_3kfs}$ | 24 | 22- 26 | 24 | 22- 26 | pF |
| Anode to grid No.1 | $C_{ag_1}$ | | max. 36 | | max. 32 | mpF |
| Anode to cathode | $C_{ak}$ | 60 | 53- 67 | 33 | 26- 40 | mpF |
| Anode to heater | $C_{af}$ | 31 | 26- 36 | 20 | 12- 28 | mpF |
| Grid No.1 to heater | $C_{g_1f}$ | 60 | 40- 80 | 55 | 35- 75 | mpF |
| Cathode to heater | $C_{kf}$ | | | 5.2 | 4.2-6.2 | pF |

**SHOCK AND VIBRATION RESISTANCE**

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

**LIFE**

Production samples are tested to be within the end of life values (column III) under the following conditions during 10 000 hours.

| | | | |
|---|---|---|---|
| Anode supply voltage | $V_{ba}$ | 165 | V |
| Anode resistor | $R_a$ | 820 | Ω |
| Grid No.3 voltage | $V_{g_3}$ | 0 | V |
| Grid No.2 supply voltage | $V_{bg_2}$ | 165 | V |
| Grid No.1 supply voltage | $+V_{bg_1}$ | 12.5 | V |
| Cathode resistor | $R_k$ | 360 | Ω |
| Anode current | $I_a$ | 35 | mA |
| Voltage between cathode and heater | $V_{kf}$ | 100 | V |

**LIMITING VALUES** (Absolute max. rating system)

| | | | | |
|---|---|---|---|---|
| Anode voltage | $V_{a_o}$ | max. | 400 | V |
| | $V_a$ | max. | 250 | V |
| Anode dissipation | $W_a$ | max. | 5 | W |
| Grid No.2 voltage | $V_{g_{2o}}$ | max. | 400 | V |
| | $V_{g_2}$ | max. | 200 | V |
| Grid No.2 dissipation | $W_{g_2}$ | max. | 1 | W[1]) |
| Grid No.1 voltage | $-V_{g_1}$ | max. | 25 | V |
| Grid No.1 peak voltage | $-V_{g_{1p}}$ | max. | 50 | V |
| | $+V_{g_{1p}}$ | max. | 50 | V |
| Grid No.1 dissipation | $W_{g_1}$ | max. | 10 | mW |

Maximum averaging time = 1 s

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[1]) Care should be taken not to exceed the rated $W_{g_2}$ value due to switching of positive supply voltages.

**LIMITING VALUES** (Absolute max. rating system) (continued)

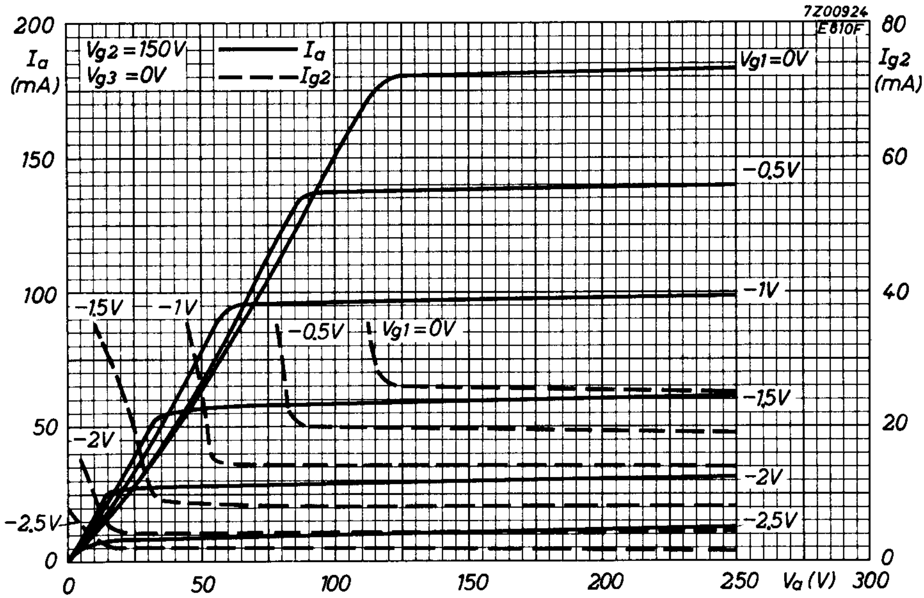
| | | | | |
|---|---|---|---|---|
| Grid No.1 resistor | | | | |
| With fixed bias | $R_{g_1}$ | max. | 0.2 | MΩ |
| With automatic bias $R_k$ = 47 Ω | $R_{g_1}$ | max. | 0.6 | MΩ |
| $R_k$ = 360 Ω | $R_{g_1}$ | max. | 3.5 | MΩ |
| Cathode current | $I_k$ | max. | 50 | mA |
| Cathode current (Life expectancy 1000 hours) | $I_k$ | max. | 65 | mA |
| Voltage between cathode and heater | $V_{kf}$ | max. | 100 | V |
| Bulb temperature | $t_{bulb}$ | max. | 200 | °C |
| Bulb temperature (Life expectancy 1000 hours) | $t_{bulb}$ | max. | 220 | °C |

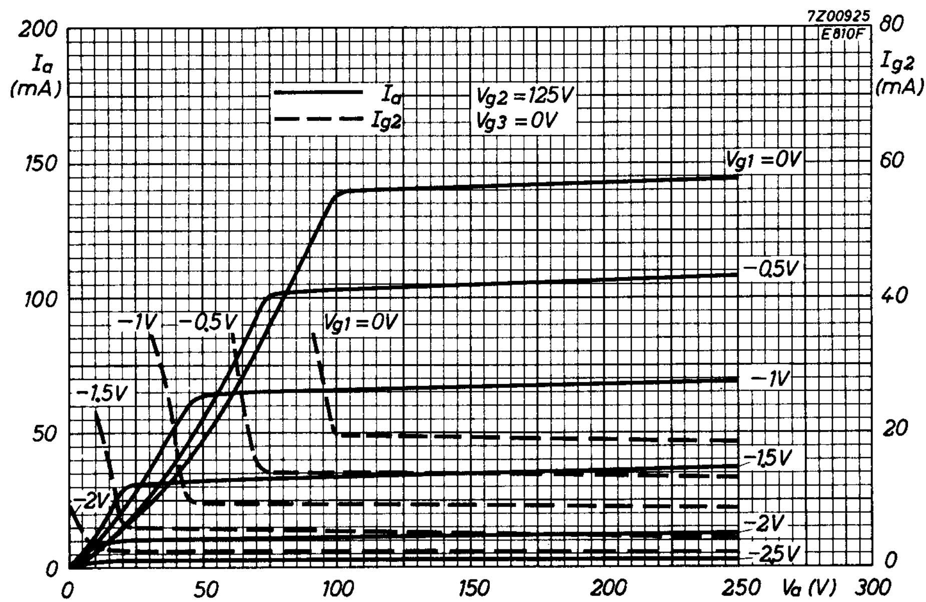
Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

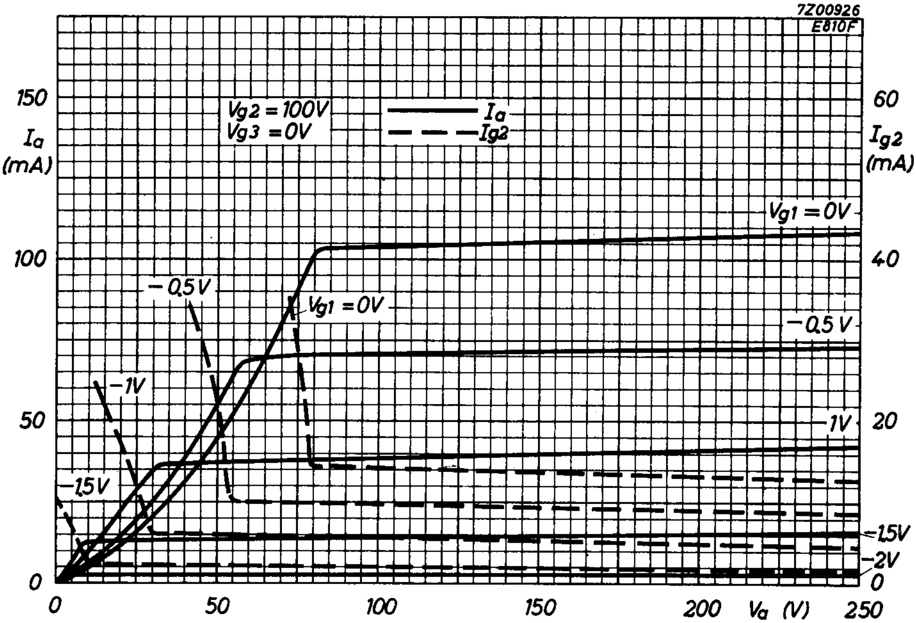
**OPERATING CHARACTERISTICS**

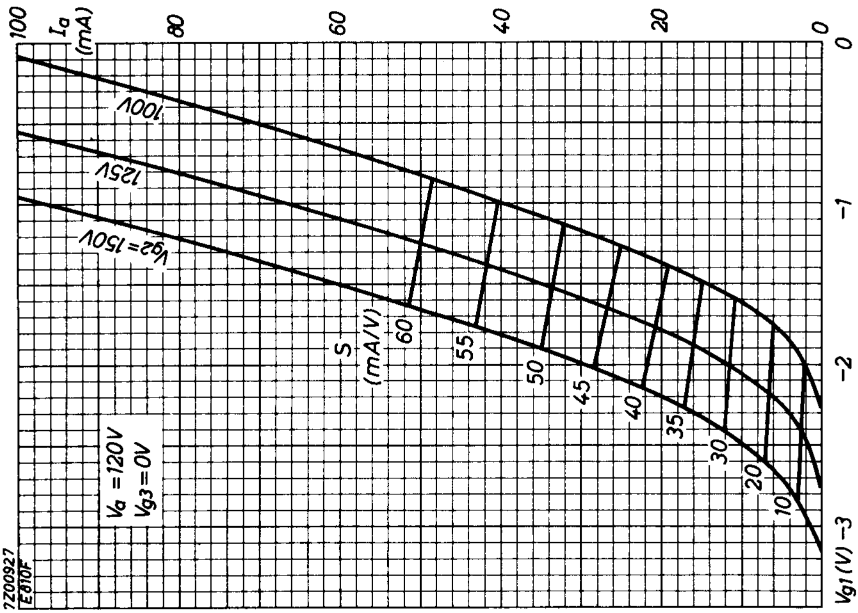
Output tube class A

| | | | |
|---|---|---|---|
| Anode supply voltage | $V_{ba}$ | 155 | V |
| Grid No.3 voltage | $V_{g_3}$ | 0 | V |
| Grid No.2 supply voltage | $V_{bg_2}$ | 165 | V |
| Grid No.1 supply voltage | $+V_{bg_1}$ | 12.5 | V |
| Cathode resistor | $R_k$ | 360 | Ω |
| Cathode capacitor | $C_k$ | 1000 | µF |
| Anode resistor | $R_{a\sim}$ | 560 | Ω |
| Anode current | $I_a$ | 35 | mA |
| Anode current, peak to peak | $I_{ap}$ | 40 | mA |
| Total distortion | $d_{tot}$ | 7.5 | % |

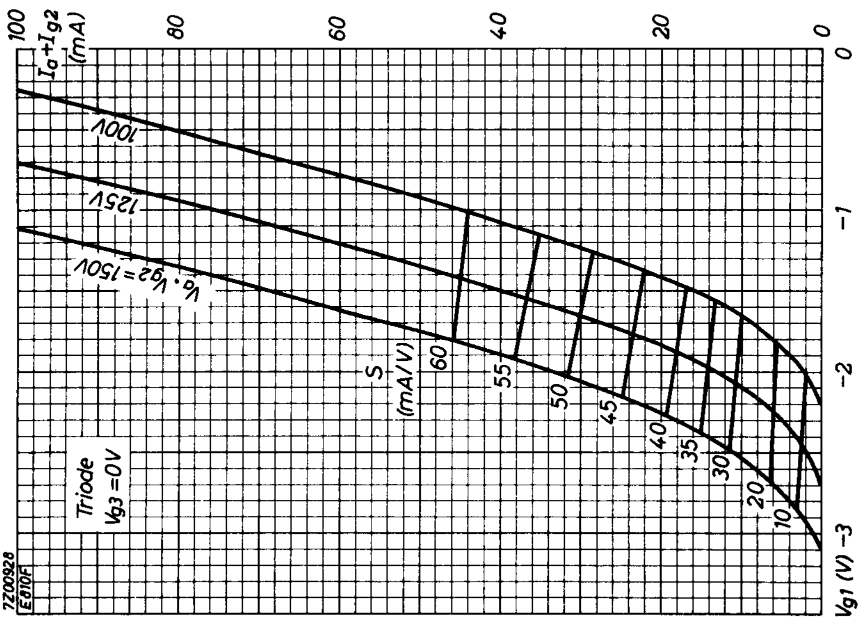

7Z00924
E810F
200
150
100
50
0
Ia (mA)
Ig2 (mA)
80
60
40
20
0
Vg2 = 150V
Vg3 = 0V
Ia
Ig2
Vg1 = 0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−1.5V
−1V
−0.5V
Vg1 = 0V
−2V
−2.5V
0
50
100
150
200
250
Va (V)
300


7Z00925
E810F
200
150
100
50
0
Ia (mA)
Ig2 (mA)
80
60
40
20
0
Ia
Ig2
Vg2 = 125V
Vg3 = 0V
Vg1 = 0V
−0.5V
−1V
−1.5V
−2V
−2.5V
−1V
−0.5V
Vg1 = 0V
−1.5V
−2V
0
50
100
150
200
250
Va (V)
300


7Z00926
E810F
Vg2 = 100V
Vg3 = 0V
Ia
Ig2
150
Ia
(mA)
100
50
0
60
Ig2
(mA)
40
20
0
Vg1 = 0V
−0.5V
−1V
−1.5V
−2V
Vg1 = 0V
−0.5 V
−1V
−1.5V
0
50
100
150
200
Va (V)
250



7Z00927
E810F
$I_a$ (mA)
100
80
60
40
20
0
$V_{g1}$ (V)
0
−1
−2
−3
100V
125V
$V_{g2}$=150V
S (mA/V)
60
55
50
45
40
35
30
20
10
$V_a$ =120V
$V_{g3}$=0V

7Z00928
E810F
$I_a+I_{g2}$ (mA)
100
80
60
40
20
0
$V_{g1}$ (V)
0
−1
−2
−3
100V
125V
$V_a$, $V_{g2}$=150V
S (mA/V)
60
55
50
45
40
35
30
20
10
Triode
$V_{g3}$=0V

PHILIPS

Data handbook

Electronic components and materials

**E810F**

| page | sheet | date |
|---|---|---|
| 1 | 1 | 1968.12 |
| 2 | 2 | 1968.12 |
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| 5 | 5 | 1968.12 |
| 6 | 6 | 1968.12 |
| 7 | 7 | 1968.12 |
| 8 | 8 | 1968.12 |
| 9 | FP | 2000.12.10 |